INEEL Research Resulted in These 30 Patents Issued in 2002

From Technology Transfer and Commercialization:

Intellectual Property (IP) in the form of copyrights and patents provides the foundation for interactions between national laboratories and other parties. The intellectual property estate of an R&D organization also serves as measure or the institution's ability to do creative, meaningful research.

In the national laboratory system the primary focus is on patents. During fiscal year 2002, 30 U. S. patents were issued to BBWI or to DOE based on inventions of INEEL scientists and researchers.

This performance is equal to that of the previous year and roughly in line with the past several years, though the trend is expected to move significantly upward over the next couple of years. In 2002, INEEL inventors submitted 105 invention disclosures to BBWI. Historically, 35-45 percent of invention disclosures in a given year result in issued patents.

BBWI has the right under its contract (subject to some exceptions) to elect to take title to inventions and seek patent coverage. The decision of whether or not to make that election and seek patent protection is based on market and technical assessments of the technology.

A thorough market assessment is performed for each technology, and a recommendation is presented to an industry focus team, usually comprised of a department or project manager, assistant lab director or designee, market analyst, account executive, and patent counsel.

These recommendations are presented before the team, where a final decision is made to elect or decline the technology for patent protection. Generally, if the invention is judged as commercially valuable, crucial to a primary mission, or valuable in terms of motivating further research funding, it is elected.

If BBWI decides to decline title, DOE then makes a decision on whether to seek patent protection in its own name. If DOE decides not to seek patent protection, the inventor(s) may petition to have title waived to them by DOE with the expectation that they will pursue patent protection using their own resources.

A brief description of each patent issued during FY 2002 based on an INEEL invention is provided on the following pages.

Peter Kong and *Jon Grandy* teamed to produce a joint invention that was patented during the last fiscal year. The **Methods of Chemically Converting First Materials to Second Materials Utilizing Hybrid-Plasma Systems** patent describes a method of conversion based on flowing hydrocarbon material through a hybrid-plasma system. The invention is intended for use in chemical & materials synthesis, energy conversion, and coating deposition.

The **Hydrogen and Elemental Carbon Production from Natural Gas and Other Hydrocarbons** technology, by *Brent Detering and Peter Kong* was also patented during 2002. This technology can convert hydrocarbons into a substantially clean-burning hydrogen fuel that produces no greenhouse gas emissions. A useful by-product of the conversion process is elemental carbon in a powder form that can be used in several industrial processes.

The work of a team of current and former INEEL investigators was awarded a patent for the **Fast Quench Reactor and Method**. The team members were: *Brent Detering, Alan Donaldson, Jim Fincke, and Peter Kong*. A fast quench reactor employs a high temperature at the inlet and a convergent-divergent nozzle at the outlet. When reactants are injected into the reactor chamber, the resulting gaseous stream is rapidly cooled as it passes through the nozzle. This faster cooling preserves the desired characteristics that the material exhibited in the heated equilibrium reaction stage.

Tom Luther, Mason Harrup and Fred Stewart were involved in patenting **Polyesters Containing Phosphazene, Method for Synthesizing Polyesters Containing Phosphazene**. This technology processes diatomic hydrogen and unsaturated hydrocarbons as reactor gases in a fast quench reactor. Reheating the reactor gases during the fast quench is intended to allow the atomic weight of the output to be controlled.

The prolific team of inventors, *Joel Hubbell* and *Buck Sisson,* earned two more patents last year. **The Vadose Zone Isobaric Well** patent describes a well monitoring and referencing technology that is immune to atmospheric pressure changes and compensates for internal pressure changes. Their patent for the **Monitoring Well** describes a self-maintaining instrument for measuring soil water potential to determine characteristics of flow and transport in the vadose zone. It can be used in many mining, environmental, and industrial applications.

Dennis Bingham was the sole inventor on the **Apparatus for Pumping Liquids at or Below the Boiling Point**, which is a pump designed to better move liquefied gases through low-pressure processes. This technology is currently being licensed to NitroCision, Progressive Technologies Inc., and CS&P Cryogenics.

Dennis Bingham and *Russell Ferguson* were granted a patent for the **Method and Apparatus for Pressurizing Vaporous Fluids**. This single stage pump can produce pressures from a few pounds to hundreds of thousands of pounds, which previously required more expensive and complex multi-stage pumps. Pressurization systems of this type are widely used in many industries.

Another team of INEEL inventors, including *Dennis Bingham, Bruce Wilding, and Michael McKellar, was* awarded a patent for their **Apparatus and Process for the Refrigeration, Liquefaction and Separation of Gases with Varying Levels of Purity**. This technology is a process for separating and liquefying component gasses from a pressurized mixed gas stream and is part of a suite of technologies being developed under a multi-million dollar CRADA with PG&E and SoCal Edison.

Terry Turner received a patent for the **Apparatus and Method for Delivering Fluid to a Container**, a device for automatically and remotely delivering fluid into a vessel. This technology could be used in a variety of radiological, medical, and testing environments.

Terry also partnered with *Bruce Wilding, Michael McKellar, and Kevin Raterman* to earn a patent for the **Two Stroke Engine Exhaust Emissions Separator**. Two-stroke engines are widely used throughout the world because they are simple, lightweight, and powerful. They are less costly than comparable four-cycle engines and are commonly used on snowmobiles, motorcycles, and chainsaws. This technology offers an option to industries struggling to meet environmental challenges related to the need for decreasing emissions levels.

The INEEL received three separate patents that are improvements to a 1998 R&D 100 Award Winner, an electro-optic voltage sensor and system for measuring high voltages in electrical power transmission and distribution lines. It can replace large, expensive, direct contact transformer-based methods that are currently used. These patents are part of a suite licensed to International Business Ventures, Inc., of Clayburne, Texas for commercial development and include the **Electro-Optic Voltage Sensor for Sensing Voltage in an E-field**, by *James Davidson, Thomas Crawford, and Gary Seifert*, the **Voltage Sensing Systems and Methods for Passive Compensation of Temperature Related Intrinsic Phase Shift** by *James Davidson* with *Gordon Lassahn*, and the **Electro-Optic High Voltage Sensor Head** also by James *Davidson* in collaboration with *Gary Seifert*.

Jim Fincke received a patent for his **Method and System for Measuring Multiphase Flow Using Multiple Pressure Differentials**. This invention is an improvement on the system for measuring a multiphase flow in a pressure flow meter for calculating gas density, and is currently under license to FMC for use in metering gas at the well-head, less expensively and more accurately than previously thought possible.

A patent was awarded for the **Method for Non-Intrusively Identifying a Contained Material Utilizing Uncollided Nuclear Transmission Measurements** to *John Morrison*, *Blaine Grover*, and *Alan Stephens*. This patent is for an improved diagnostic method to identify contained target material and estimate ratios of a macroscopic neutron cross-section. It has use in a variety of fields, including national security.

Another in a suite of technologies developed by *Nancy Carlson, John Walter, John Johnson, and David Tow*, the **Apparatus and Method for Measuring the Thickness of a Coating**, is an invention that will be valuable in a variety of manufacturing and quality control applications. It is a method for determining the thickness of a coating on a substrate by examining the velocity of wavelengths induced in the coating.

Christopher Allen, Eric Peterson, and an outside collaborator teamed for the **Solid State Synthesis of Poly(Dichlorophosphazene)** patent. This environmentally-friendly technique can be used to make the family of polymers known as polyphosphazenes. The INEEL is widely recognized as the world leader in development of the materials and their applications. The technology is simpler, cleaner, and less expensive than current approaches.

The next patent is rather unique to the INEEL portfolio. The **Gender Determination of Avian Embryos** by *Keith Daum* and *David Atkinson*, is a method to determine gender in bird embryos using ion mobility spectrometry. Researchers and farmers often need birds of a specific gender for their work. This technology increases their efficiency by allowing them to incubate only eggs of the gender needed.

Herschel Smartt, John Johnson, Eric Larsen, Rodney Bitsoi, Ben Perrenoud, Karen Miller, and David Pace collaborated on the **Apparatus for the Concurrent Inspection of Partially Completed Welds**. This technology inspects welds in combination with a welder that moves reciprocally along the weld path. It can be used in construction, manufacturing, and a variety of other fields.

The **Methods and Systems for Seed Planting Management and Control** was another group-effort. An INEEL team of researchers, including, *John M Svoboda, Richard Hess, Reed Hoskinson, and David Harker,* invented this system to provide optimal spacing in a planted agricultural field. This technology can be used in planting seeds or plantlets of high-value crops such as vegetables and strawberries.

The **Method and Apparatus for Measuring the Mass Flow Rate of a Fluid** patent recognizes the efforts of *Robert Evans, Curtis Wilkins, Lorenzo Goodrich and Jonathan Blotter*. This invention came about through the need to measure the two-phase mass flow in a geothermal plant. This technology eliminates the common problem of fouling by placing the instrument external to the flow.

A significant patent in the area of water quality was awarded to *Ryan McMurtrey, Daniel Ginosar, Kenneth Moor, Michael Shook, John Moses, and Donna Barker* for their **Apparatus and Method for Extraction of Chemicals from Aquifer Remediation Effluent Water**. This technology addresses the common problem of contamination of water with Dense Non Aqueous Phase Liquids. EPA estimates that over 10,000 contaminated sites exist nationwide.

The **Position Detectors, Methods of Detecting Position and Methods of Providing Positional Detectors** invention received a patent based on the work of *Dave Weinberg, Dean Harding, and Eric Larsen*. The patent is currently licensed to Saipem, an Italian offshore pipeline manufacturer. The device was developed to provide location information on automatic weld heads and inspection sensors during the welding and inspection process.

Vance Deason and Ken Telschow partnered to develop the **Method and Apparatus for Detecting Internal Structures of Bulk Objects Using Acoustic Imaging**. Based on the previously patented INEEL Laser Ultrasonic Camera, this patent extends the usefulness of the camera to discovering buried defects or other internal features in solid objects. Applications include nondestructive testing and materials research using ultrasonics.

A patent was awarded for the work of *Stuart Snyder, Judy Partin, Jon Grandy, and Charles Jeffery* for the **Ambient Method and Apparatus for Rapid Laser Trace Constituent Analysis**. Laser Induced Breakdown Spectroscopy and Laser Induced Fluorescence are used in combination to measure the absorption rate of a material. By comparing the rate against a known value, the amount of material in the sample can be determined. This technique could be used in a number of industries where detection of trace amounts of contaminants is important.

Oleg Kotlyar was awarded two separate patents during the last fiscal year for the **Mechanical Seal Assembly**, which is an improvement on existing seals, which are subject to substantial vibration stress.

A patent was awarded for the **Method for Non-Intrusively Identifying Contained Material Utilizing Uncollided Nuclear Transmission Measurements** to *John Morrison*, *Blaine Grover*, and *Alan Stephens*. This patent is for an improved diagnostic

method to identify contained target material and estimate ratios of a macroscopic neutron cross-section. It has use in a variety of fields, including national security.

The **Multiple Cell Radiation Detector System, and Method, and Submersible Sonde** was developed by *Larry O. Johnson, Charles McIsaac, Robert Lawrence, and Ervin Grafwallner*. This technology is a self-contained radiation detector system for the detection of radionuclides in boreholes, groundwater, effluent streams, soils, and in other environmental applications.

Dieter Knecht and *Troy Tranter* developed the **Open-Cell Glass Crystalline Porous Material** technology that was also awarded a patent in 2002. This technology is a porous material made from hollow microspheres that are bound together and can be used to absorb and immobolize radioactive nuclear waste. It is also useful in a variety of other applications including heat-resisitant filtration systems, supports for catalysts, adsorbents, and ion-exchangers.

END